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D 3.1 “Pilot test Czech Republic”

WEEE TRACE
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Version	Date	Reason
01	September 2012	First issue
02	October 2012	Revision and update to include new information
03	November 2012	Revision and update to address issues raised by P.O. resulting from Progress Report Review. Correction of types and detected inconsistencies.
04	April 2013	Revision and update to address issues raised by P.O. resulting from Interim Report Review. Correction of types and detected inconsistencies.

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1. Executive Summary

This deliverable presents the activities dedicated to the Czech Pilot and describes specific results of this phase.

This report describes actions adopted under Czech Pilot, actors involved, issues to addressed, planning and connection with other tasks or deliverables of Project.

Finally, as commented in the deliverable D2.2 "Definition of Czech Pilot requirements", it was included a Preliminary unit step before the Prototype unit phase.

Additionally, the preliminary unit was extended four additional months (M18) and include some extra actors. Then, prototype phase is starting now.

(i) **1st phase: Preliminary Unit Construction (M1-M4**), SW development

(ii) **2nd phase: Basic preliminary unit (M5-M10),** SW development. Borrowed equipment. Test trials were carried out under laboratory conditions.

(iii) **3rd phase: Complete preliminary unit (M11-M20),** within this phase was projected detailed design solution (based on the previous experiences) and integrated solution of all SW modules. Field tests were carried out from Month 16 to Month 20 (4 months). Primary pilot tests were submitted in Month 14. Extension of pilot tests was from Month 14 to Month 20 - this phase includes field tests at reloading site (to March – M20). We will submit outcomes from field tests in 14 days.

- Prototype will be constructed based on experiences with preliminary unit. This phase will be prolonged from M29 to M33 due to the field tests carried out with the preliminary unit. These **tests** were **critical** to purchase the adequate equipment to be assembled in the prototype. Within this phase will be developed central information SW, purchased another cameras adapted to the prototype and constructed aligning head.

2. Introduction

This Deliverable 3.1 “Pilot Test Czech” describes major activities executed and objectives achieved in the Czech Pilot.

The main aim of this report is to present the activities dedicated to project develompent and work done so far within the project schedule. This report mostly deals with preliminary tests that were performed and it also focuses on technical chalenges that occured during the project development. Tests mentioned hereinafter were made firstly with borrowed equipment in order to verify its efficiency prior to its buying.

It should be highlighted that the pilot phase has gone beyond what was initially planned and will be expanded 4 months. The reason for this additional extra time it is due to the field tests carried out in the Preliminary Unit phase.

Project partners involved in this phase include:

- Partner #1: MCCTELECOM, technology provider
- Partner #6: ASEKOL, waste manager

3. Description of Actions

3.1 Summary

As it is explained in the Executive summary, it could be considering the following phase in the Czech Pilot Development

(i) **1st. phase**: **Preliminary Unit Construction** (M1-M4), SW development

(ii) **2nd. phase: Basic preliminary unit** (M5-M10), SW development. Borrowed equipment. Test trials were carried out under laboratory conditions.

(iii) **3rd. phase: Complete preliminary unit** (M11-M20), within this phase was projected detailed design solution (based on the previous experiences) and integrated solution of all SW modules. Field tests were carried out from Month 16 to Month 20 (4 months). Primary pilot tests were submitted in Month 14. Extension of pilot tests was from Month 14 to Month 20 - this phase includes field tests at reloading site (March 17). We will submit outcomes from field tests in 14 days.

3.2 Location

There is only one preliminary-unit. Then, with some equipment of the preliminary unit and new ones, **the prototype is going to be constructed and will be located in one place**. Probably, it will be located at **Enviropol´s reloading site near Prague**). This pace reflects the requirements needed for the field tests (fine-tuning of the preliminary unit at dust-free environment, testing at reloading site where WEEE appliances are available).

3.3 Schedule

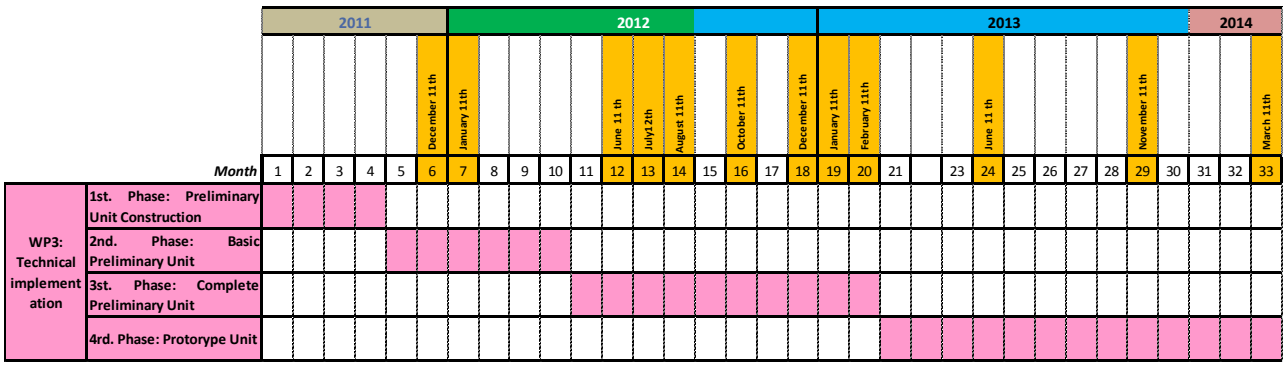
As explained the Pilot was extended and divided in 3 phases:

(iv) **1st. phase: Preliminary Unit Construction (M1-M4**), SW development

(v) **2nd. phase: Basic preliminary unit (M5-M10),** SW development. Borrowed equipment. Test trials were carried out under laboratory conditions.

(vi) **3rd. phase: Completed preliminary unit (M11-M20),** within this phase was projected detailed design solution (based on the previous experiences) and integrated solution of all SW modules. Field tests were carried out from Month 16 to Month 20 (4 months). Primary pilot tests were submitted in Month 14. Extension of pilot tests was from Month 14 to Month 20 - this phase includes field tests at reloading site (March 17). We will submit outcomes from field tests in 14 days.

- Prototype will be constructed based on experiences with preliminary unit. This phase will be prolonged from M29 to M33 due to the field tests carried out with the preliminary unit. These **tests** were **critical** to purchase the adequate equipment to be assembled in the prototype. Within this phase will be developed central information SW, purchased another cameras adapted to the prototype and constructed aligning head.



New schedule of activities of WP3. Forecast duration of activities that still continue

3.4 Detailed analysis and proposal of identification process

The completed feasibility study confirmed that the intention is feasible. The proposed design for the solution is based on the conclusion of the mentioned analysis. This phase is successfully completed.

3.5 Development of software for identification

This phase is completed and all deliverables were successfully tested under laboratory conditions as well as they had been tested at reloading site during the field tests. After its finishing there is an assumption that some partial adjustments will have to be done.

In order to perform the final identification of the device in question, all gathered pieces of information have to be combined to produce a single result – either a positive identification or an indication of an unknown device.

3.6 Building-up the preliminary unit of hardware part that will carry out identification of taken-back equipment

A simple conveyor belt (basis of the preliminary unit) was built on for the purpose of testing of the previously developed software. This conveyor has been modified to be able to provide all necessary functionality for field tests. Detailed design of the preliminary unit is already finished and the unit is physically constructed.

The preliminary unit is the most crucial part of the whole project. Due to the fact that many parts are custom-made for this specific and unique unit the work (assembly of all the eqiupment) was finished at end of November 2012 for the field tests.

3.7 Development of software for operation control and database administration

The modified preliminary unit has to be controlled and monitored by means of dedicated software application. Development of this application was finished.
The database of identification data has to be accessible for users as well. For ease of use of the database administration has been incorporated into the conveyor monitoring application. A thin client web application is expected to be developed in next phases of the project based on experiences with this preliminary version.

3.8 Verification of the preliminary unit in practice

The start of verification of the preliminary unit was dependent on availability of its extended version of the preliminary unit. The construction of the unit was underway until the end of November 2012. An appropriate location at our relaoding site was chosen and was adapted to suit the needs of the project. Commencement of field testing has started in December 2012.

Preliminary estimation of building up the prototype was June 2013. Currently we are not able to define the term of transition between preliminary unit and prototype exactly since we have to finish the pilot tests at first (these are expected at the end of March 2013). The results are fundamental for defining the final design of the prototype (construction itself with respect to broad range of shapes of WEEE) and its logical incorporation into the processing.

4. Tests Preliminary Unit

Since the project progress is divided into specific phases there were also primary tests made within these particular phases.

First exhibition of the preliminary unit in operation was held in May 2012 in Prague. The demonstration of the conveyor itself was prepared for MCCTELECOM and ECOLEC (project partners) within the meeting focused on the current project development and discussions and exchange of experiences in usage of barcode readers, collection and tracking of WEEE.

Except internal project meeting we had a meeting with WEEE container producer as well (to introduce the Spanish part our containers) and we visited local collection backyard and treatment operator's facility in order to demonstrate how the collection system of ASEKOL works in general. Another part of the programme was devoted to barcode problematics itself due to keen interest of Spanish project partners. There was prepared a presentation describing ASEKOL's tracking system of WEEE and its difficulties met.

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4.1 Results

The results are displayed in the table below:

Testing results – reading efficiency	
reading efficiency	91,8 %
average time of detection	2,69 s

Figure 1: Results of reading – attribute 1

Results achieved were considered to be high and it fulfilled the presumptions necessary for other utilisation within further project phases. Also time demandingness was very satisfying since it's one of the key factors influencing its utilization in full operation.

Testing results – reading efficiency	
Set of light group	90 %
- provided that there's not any additional information	74 %
Set of dark group	41 %
- provided that there's not any additional information	39 %

Figure 2: Results of reading – attribute 2

Tested light group showed sufficient results of recognition. These results reflect the specified requirements. In case of dark group there is expected to achieve better results thanks to lighting adjustments.

Average detection time was approximately 4 sec. which is adequate due to huge amount of data being processed and operations being done. Time necessary for the identification can be reduced thanks to further optimisation (however out of range of this project).

4.2 Database

Database was filled in with data collected via several web pages that wrote down the lists of TV and PC monitors of producers. The database was formed by few thousand of items. Although this amount didn't cover the number of equipment available at the reloading sites it was absolutely sufficient for the purposes of demonstration and verification of function of SW developed for identification.

The data gathered came from 67 producers of EEE of well-known companies, i.e. Samsung, LG, Phillips etc. Database and SW module is designed and implemented so that it enables arbitrary extension and filling the database with further relevant data about products and producers. However the database was created for the purposes of demonstration and it's not optimized for extensive application at full scale so far.

4.3 Results at reloading site

The tests mentioned hereinabove were done under laboratory conditions. The field testing itself has started at December 2012 at reloading site. First test done indicated that the success rate of the preliminary unit is similar to results measured previously in the laboratory conditions especially as for attribute 1; better results of identification of attribute 2 are expected after further adjustment. The test results can be seen in the tables below:

LCDs

Parameter	Value
average processing time	5,65 sec.
Successful identifications (attribute 2)	79,2 %
Successful identifications (attribute 1)	91,9 %

Figure 8: Results of LCDs

CRTs

Parameter	Value
average processing time	3,93 sec.
Successful identifications (attribute 2)	61,7 %
Successful identifications (attribute 1)	91,5 %

Figure 9: Results of CRTs

5. Deviations

While considering current status of the project phase in comparison with Annex 1 there are several deviations that we'd like to point out.

- Aligning head indicated in Annex 1 (page 39) will be designed in further project phase.
- Pilot tests phase prolongation: As mentioned several times, ASEKOL is facing a project, whose solution is beyond the frame of present scientific possibilities. The period dedicated to the pilot was initially planned to be until M13 (September 2012) in accordance with Annex 1 (page 45) whereas field tests at reloading started at M16 (December 2012). However, we were able to submit preliminary tests. This postponing was caused due to several challenging technical issues connected to image acquisition devices and depth of field; vertical movement unit, HW integration and barcode reading (as described in Interim report).
- Preliminary unit was relocated. These displacements are reflecting current requirements of individual project phases (fine-tuning of the preliminary unit at dust-free environment, testing at reloading site where WEEE appliances are available). In any case, there is no change in the actors involved in the project.
- Depreciation period was changed from 48 months to 84 months due to the requirements of accounting system in the Czech Republic; this period was recommended internally by the Financial Department, this period chosen is more adequate with respect to a character of usage of such unit.

6. Conclusions

This report has dealt with project primary pilot tests as well as description of status quo of the project progress. Test results done indicated that the success rate of the preliminary unit is similar to results measured previously in the laboratory conditions especially as for attribute 1; better results of identification of attribute 2 are expected after further adjustment. We were not able to submit the tests on the completed preliminary unit until September 2012 but only tests made with borrowed equipment. This seemed as a best way how to get the appropriate knowledge and conception which solution to decide for before purchase of optimal equipment.

Currently, the preliminary unit is assembled and fully equipped with all necessary devices for the final testing. The system requires integration of all software modules, optimization of SW and HW communication and components improvement. Emphasis will be placed on data collection at reloading site, its form and the way of keeping as well as on unidentified pieces. We will precisely monitor the reason of failed identification and the possible ways of improving the process of recognition.

The tests made hereinabove were done under laboratory conditions firstly and later on they were launched at reloading site (from December 2012 up to now). We are going to update the pilot tests after its finishing; the final results are expected at the end of March 2013 as mentioned above).

7. Hours overview

The table below shows the time spent on project progress since within the period from 12th July 2012 to 15th April 2013.

Categories of staff to work on the project	Hours
Senior Expert	364
Junior experts (3 people)	1129

Figure 8: Overview of hours spent